

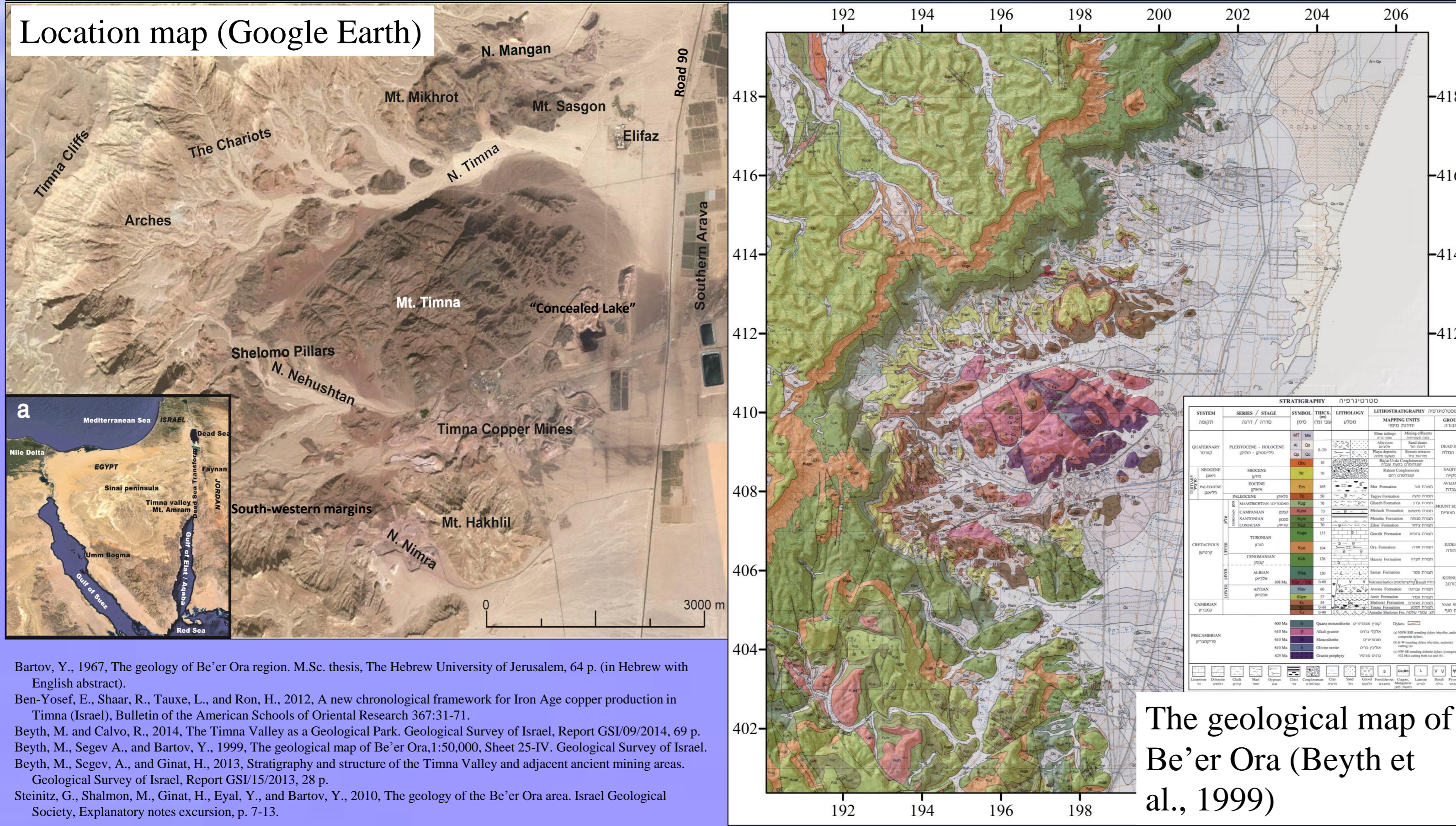
The Timna Valley as a Geological Park

Michael Beyth and Ran Calvo

Geological Survey of Israel, 30 Malkhe Israel, Jerusalem 95501, Israel

Timna Park is a major tourist attraction in the southern Arava and of major scientific archeological and geological interest (Ben Yosef et al., 2012; Beyth et al., 2013). The goal of the presented initiative is to make the unique geology of the Timna Valley and its surrounding more attractive to the tourist, amateur geologist and students based on the up-to-date research and recent mapping. This project is carried out by the Geological Survey in cooperation with the Dead Sea and Arava Science Center and the Timna Park Development Company. 62 stations mainly along the Israel National Trail, where the detailed geological description presented is supported by drafts, maps and photos. The hard-copy report is available to download at the Geological Survey web-site. The final goal is to make it accessible to each visitor through a mobile multi-sensory cellular application (like "Maslulari" developed by the Dead Sea and Arava Science Center) which will be available to iPhone and Android users.

The stratigraphy and structure of the Timna Valley is summarized by Beyth et al., (2013 available in www.gsi.gov.il). The present project was published as a report of the Geological Survey (Beyth and Calvo, 2014, in Hebrew, available in www.gsi.gov.il). Timna geological park was divided into three areas: (A) The Timna Valley; (B) The north-western highlands; and (C) The southern margins. The stations, roads and trails, including the Israel National Trail, were marked on the very recent geological maps of each area. An up-to-date reference list is attached to the reports and a list of the GPS locations of all the stations.

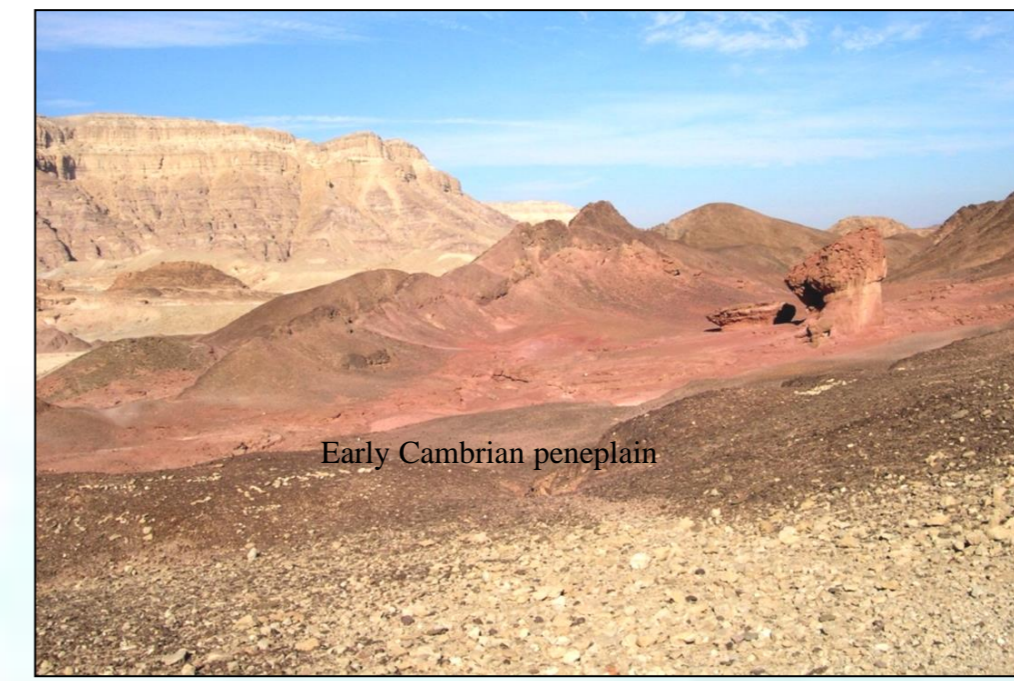


Baron, Y., 1967, The geology of Be'er Ora region, M.Sc. thesis, The Hebrew University of Jerusalem, 64 p. (in Hebrew with English abstract).
 Ben-Yosef, E., Shaar, R., Tauxe, L., and Ron, H., 2012, A new chronological framework for Iron Age copper production in Timna (Israel), Bulletin of the American Schools of Oriental Research 367:31-71.
 Beyth, M. and Calvo, R., 2014, The Timna Valley as a Geological Park, Geological Survey of Israel, Report GS109/2014, 69 p.
 Beyth, M., Segev, A., and Barot, Y., 1999, The geological map of Be'er Ora, 1:50,000, Sheet 25-IV, Geological Survey of Israel.
 Geological Survey of Israel, Report GS15/2013, 28 p.
 Steiniz, G., Shalmon, M., Ginat, H., Eyal, Y., and Barot, Y., 2010, The geology of the Be'er Ora area, Israel Geological Society, Explanatory notes enclosure, p. 7-13.

The Timna Valley



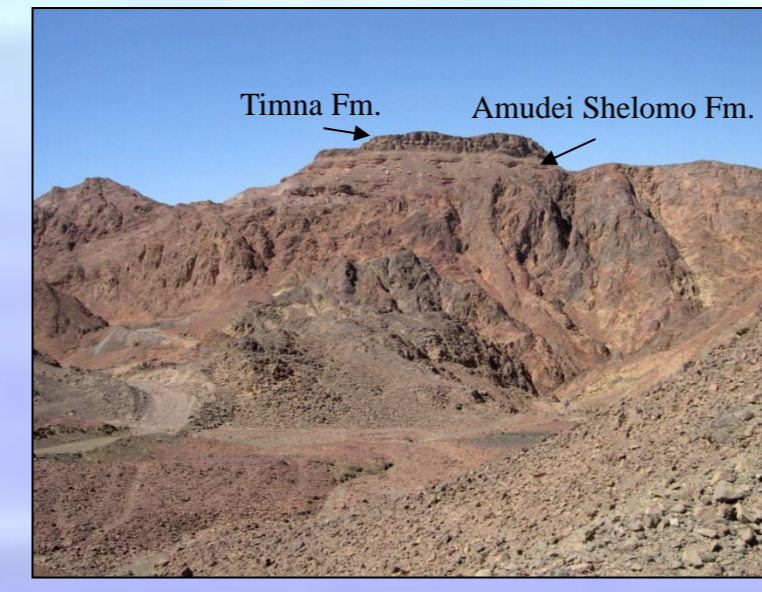
Station #26: Burrows at top Amir Formation at the Arches site.



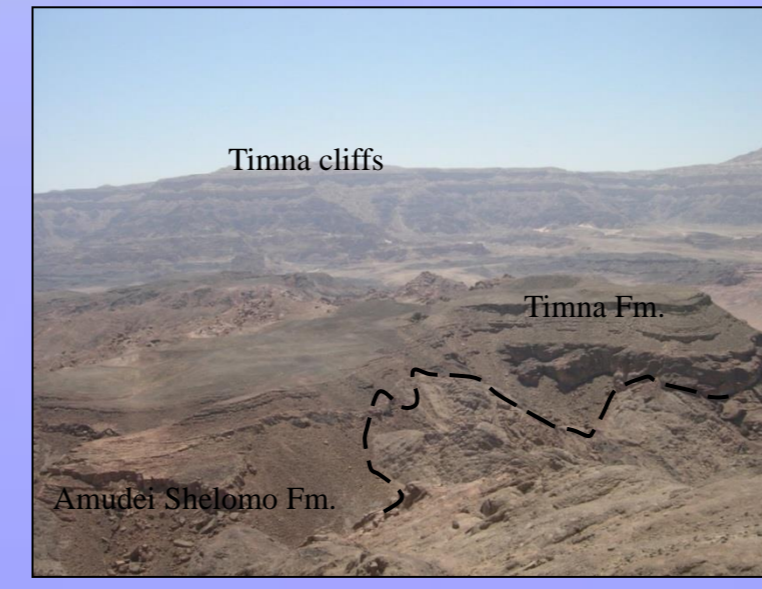
Station #29: The Early Cambrian penneplain at the "Petria" (mushroom) which is build of the conglomerates and sandstones of Amudei Shelomo Formation.



Station #28: The stratigraphic section at the Chariots site.



Station #11: Amudei Shelomo and Timna formations at the top of Mount Timna.



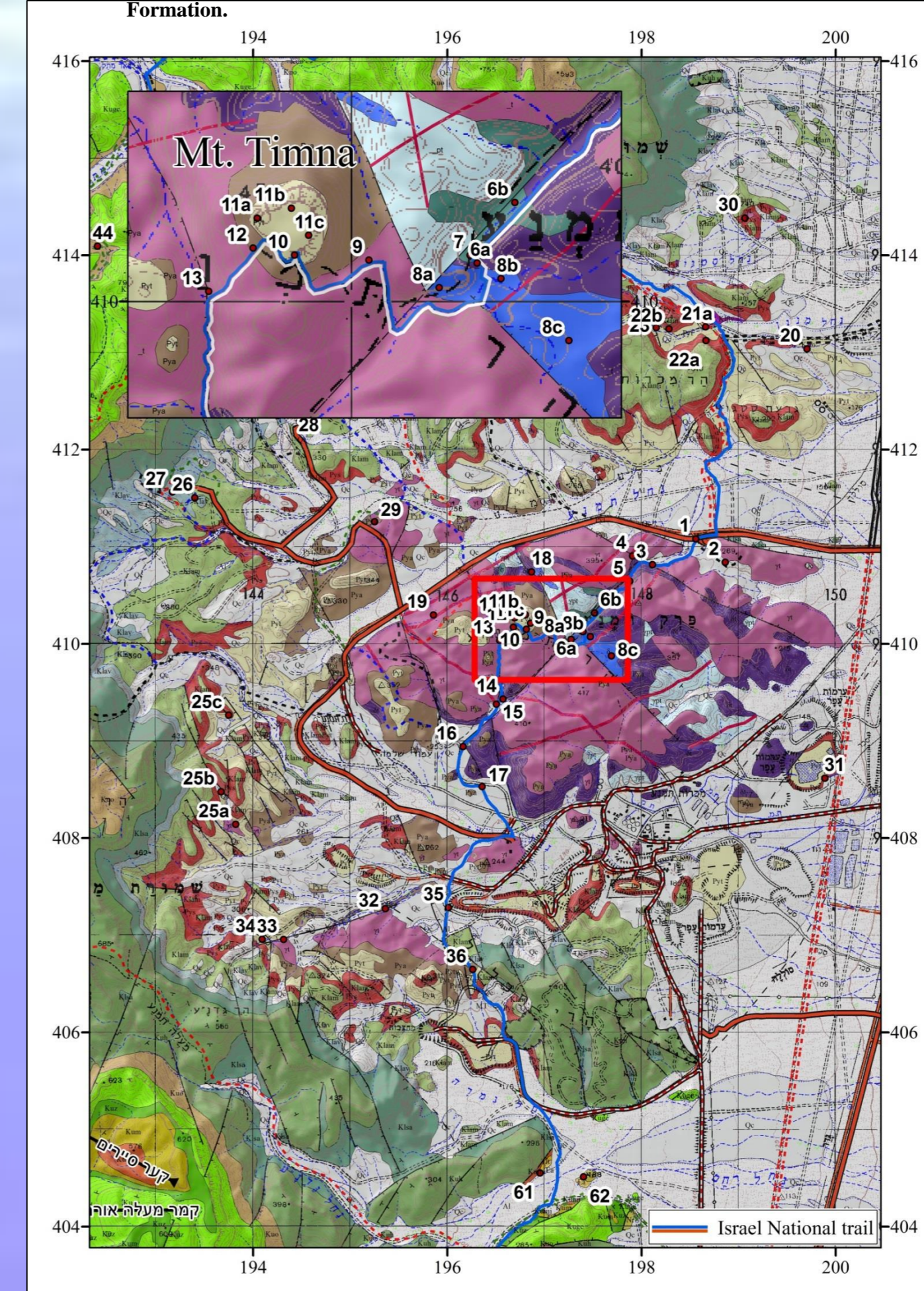
Station #13: Onlap of Amudei Shelomo and Timna formations on the Early Cambrian penneplain.



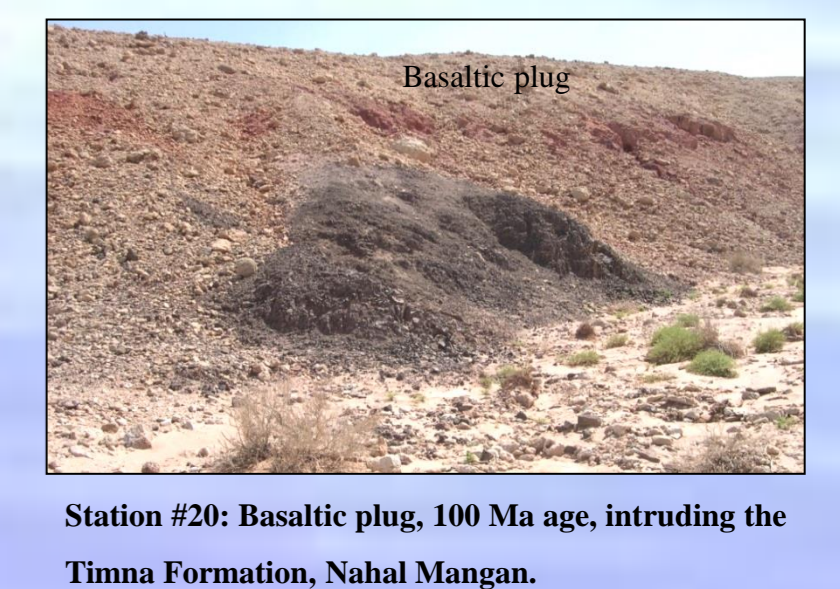
Station #25a: Halite pseudomorphs in sandy dolomite of Timna Formation, Step Faults.



Station #25b: Normal fault striking north-west-north, Step Faults.



The geological map of the Timna valley (Beyth et al., 1999, Be'er Ora) where the descriptions are submitted in the framework of the following sub-areas: The Timna Igneous Complex (TIC) of Mount Timna (#2-17); The Arches (#26-27) and the Chariots (#28) sites where the ancient copper mines were found; The Early Cambrian volcanic activity along Nahal Mangan (#20-23); The Step Faults (#25); "Small Timna" (#30); The "Concealed Lake" (#31); The south-western margins of the Timna Valley (#32-36).



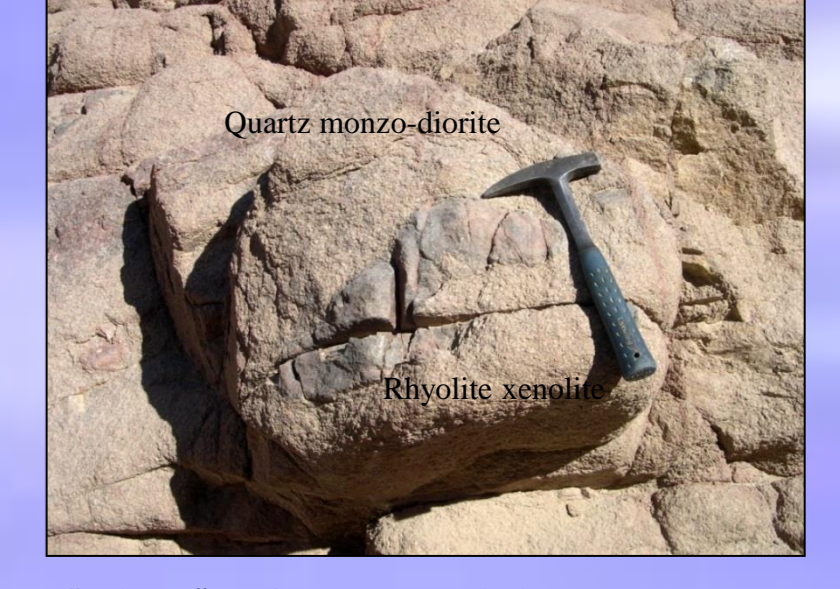
Station #20: Basaltic plug, 100 Ma age, intruding the Timna Formation, Nahal Mangan.



Station #8b: Partly altered olivine-norite.



Station #17: Composite dyke, rhyolite at the center, andesite at both margins.



Station #6: Quartz-monzodiorite, the youngest igneous intrusion in the TIC, 600 Ma, with rhyolite xenolith.



Station #19: Dyke swarm at the northern margins of Mount Timna.

The north-western highlands

The southern margins

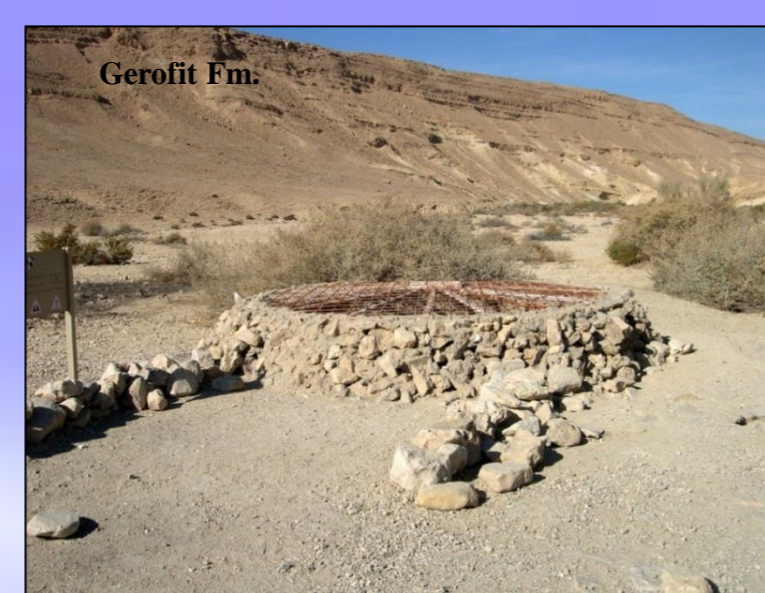
Station#	Station name:
1	View of Timna Valley from east.
2	Abandoned taluses.
3	River terraces, Nahal Alachson.
4	Sinistral displacement of dykes along a north-west striking fault.
5	Igneous boulders, Nahal Alachson.
6a	Quartz-monzodiorite, the youngest intrusive rock in the TIC.
6b	Xenoliths in the quartz-monzodiorite.
7	Rhyolite dyke with copper mineralization.
8a	Trench in the "Deshe"-altered norite.
8b	Altered norite.
8c	The "Deshe"-altered norite, along a normal fault.
9	Junction of the Israel National Trail and Nahal Alachson.
10	Mineralization of copper in the Timna Formation.
11	View point from top Mount Timna.
12	West decline from Mount Timna.
13	Early Cambrian penneplain, onlap of Amudei Shelomo and Timna formations.
14	Granodiorite and alkali granite.
15	The dolerite dyke.
16	Junction of Nahal Alachson and Nahal Nehushtan.
17	The composite dyke.
18	Olivine norite.
19	Swarm of dykes.
20	Basaltic plug.
21	The volcanic vents.
22	Prospection pit for manganese.
23	Karstification of the Cambrian dolomite.
24	Avrona Formation.
25	The Step Faults.
26	Burrows, top Amir Formation.
27	The Arches.
28	The Chariots.
29	The Early Cambrian penneplain.
30	"Small Timna".
31	The "concealed Lake".
32	The Alkali granite.
33	Reverse fault.
34	Karstification stripe.
35	Copper quarry.
36	South view point.
37	Bikat Sayarim.
38	Talus of chert concretions.
39	Milhan Fault.
40	Bir Milhan.
41	Ammonites of Ora Formation.
42	Unconformity at the top of Hazera
43	View to Zukei Timna-Timna Cliffs.
44	Nahal Metek.
45	Mount Berech.
46	Maale Sayarim.
47	"Ezba Elohim".
48	Gevei Etek.
49	Etek Syncline.
50	View on Mount Amram from east.
51	Junction of red and black trails.
52	Horse of Amir Formation.
53	Nizoz Fault.
54	Sandstones of Samar Formation.
55	A geological profile from Ora through Mishash formations.
56	The Themed Fault.
57	The evacuated camp of Beer Ora.
58	Ora anticline.
59	Top Ora Formation.
60	South marginal fault of Nahal Raham
61	Northern margins of Nahal Raham Graben.
62	Raham Conglomerate.



Station #38: Talus of chert and limestone concretions, Sayarim Valley.



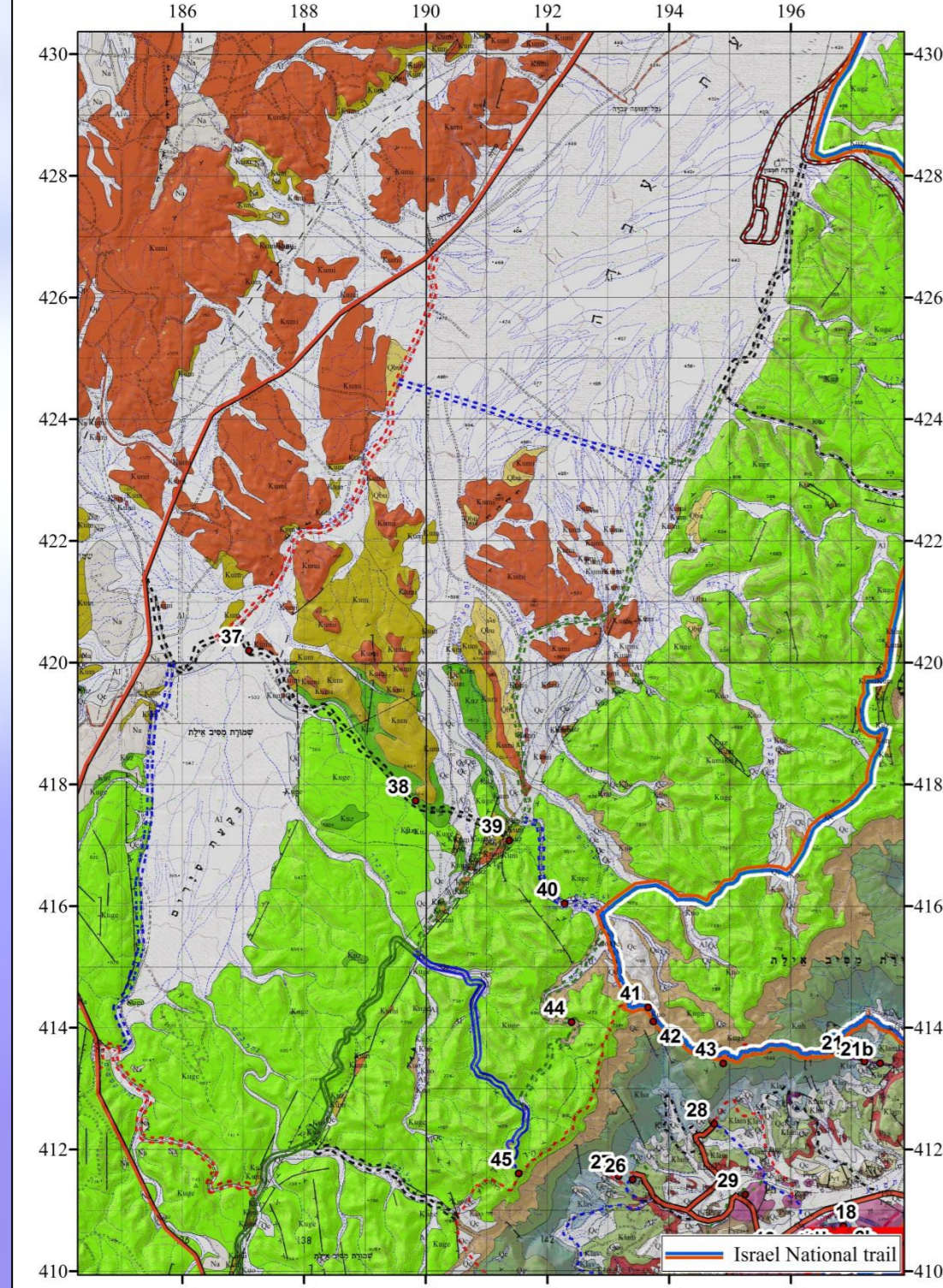
Station #39: Limestone concretion vertically tilted along the Milhan Fault.



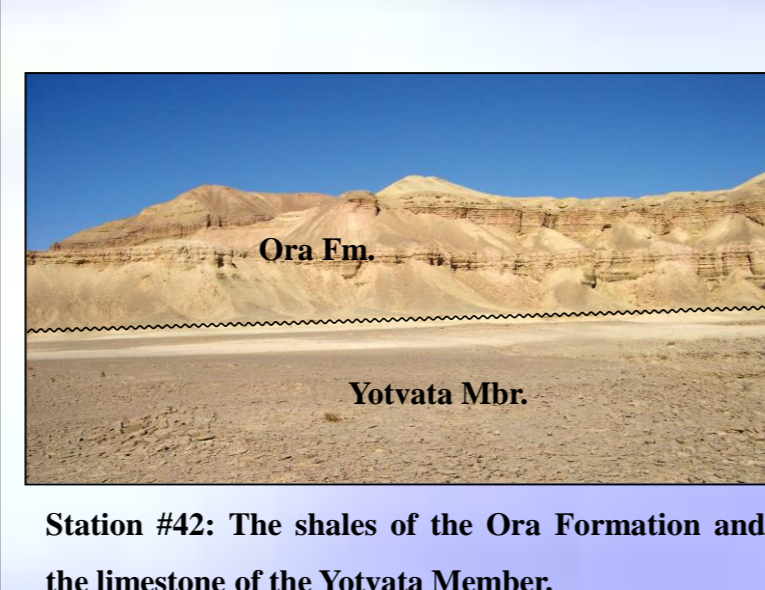
Station #40: Bir Milhan.



Station #41: Ammonites, mainly Choffaticeras and Vascoceras, Ora Formation.



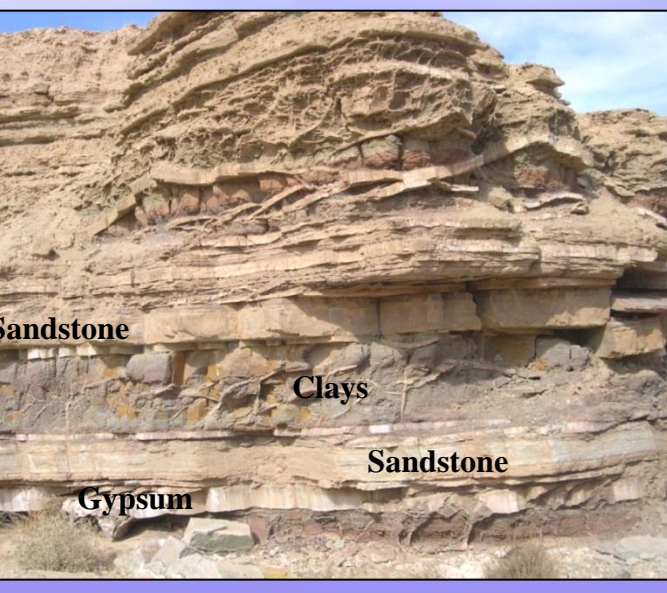
The geological map of the north-western highlands (Ginat, 1991, Yotvata and 2001, Mitzpe Sayarim; Beyth et al., 1999, Be'er Ora; Segev and Beyth, 2000, Har Seguv). The major subareas are N. Milhan and Mt. Berech.



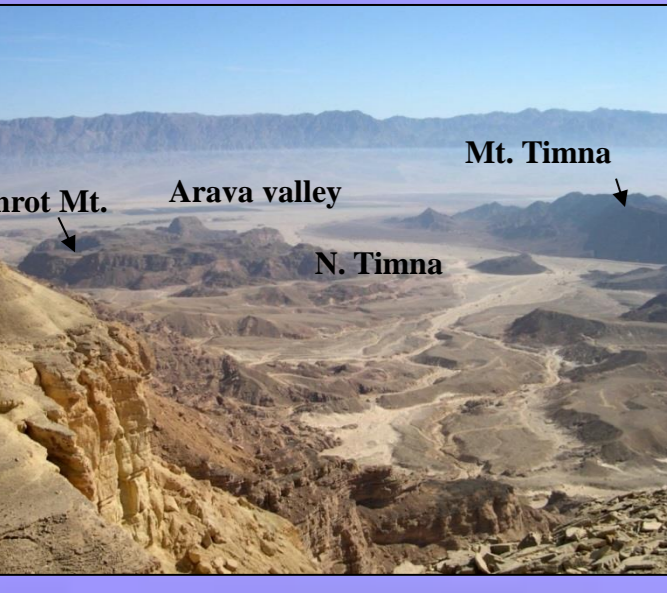
Station #42: The shales of the Ora Formation and the limestone of the Yotvata Member.



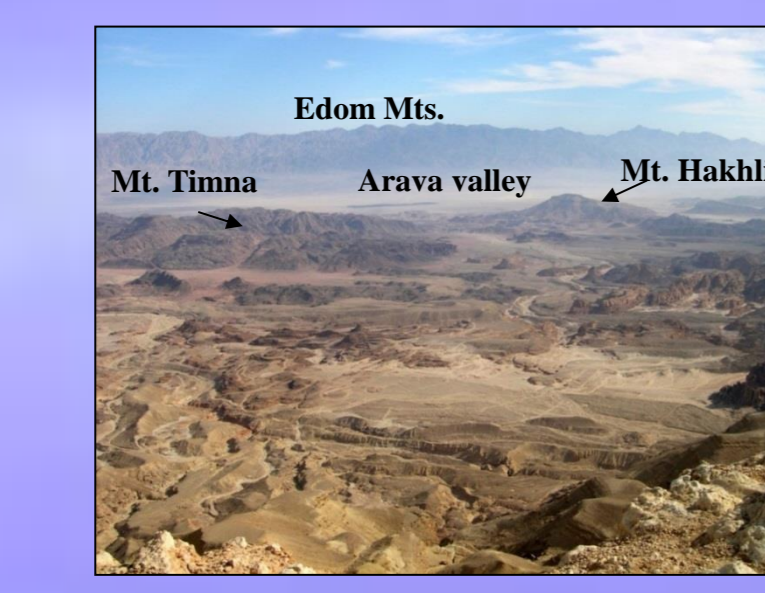
Station #43: A view of the Timna Valley from top Yotvata Member, "Zukei Timna" (Timna Cliffs).



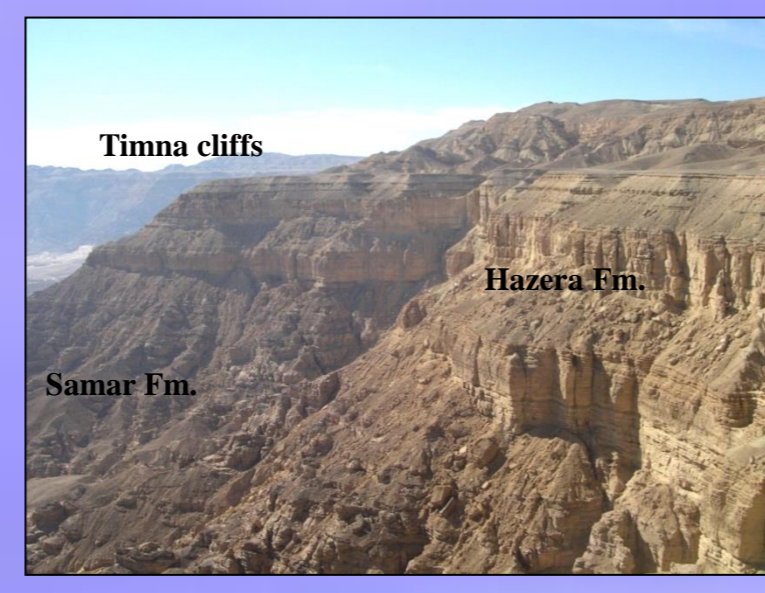
Station #44: Well bedded shale, gypsum and sandstone, Ora Formation, Nahal Metek.



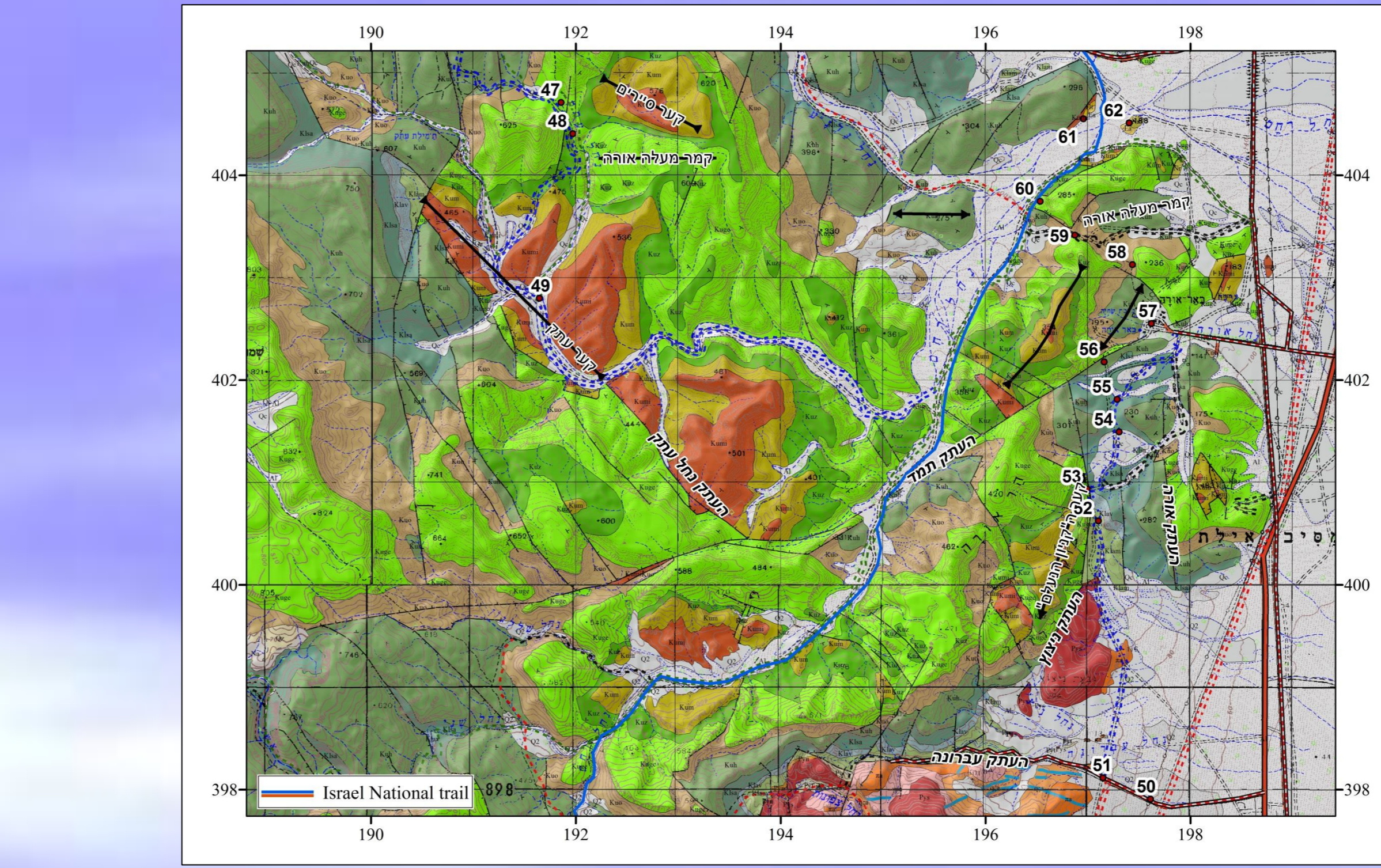
Station #45: View of the Timna Valley, the Arava Valley and Edom Mountains from Mount Berech.



Station #43: A view of "Zukei Timna" (Timna Cliffs).



Station #50: The Givat Zafrin syncline formed along the western marginal faults of the DST east of Mt. Amram.



The geological map of Nahal Eteq and the area between Mount Amram and Nahal Ninra (Barot, 1967; Beyth et al., 1999, Be'er Ora and Elat).



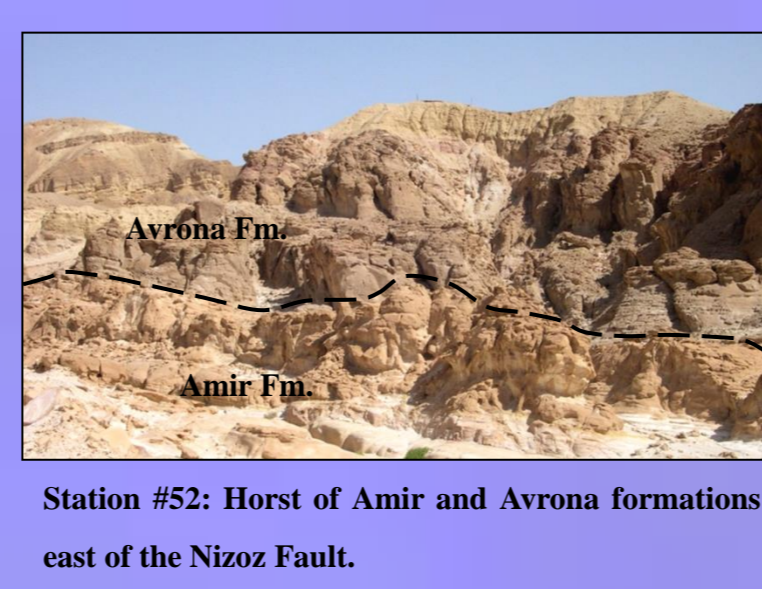
Station #53: Deformation along the Nizoz Fault, Avrona cliffs.



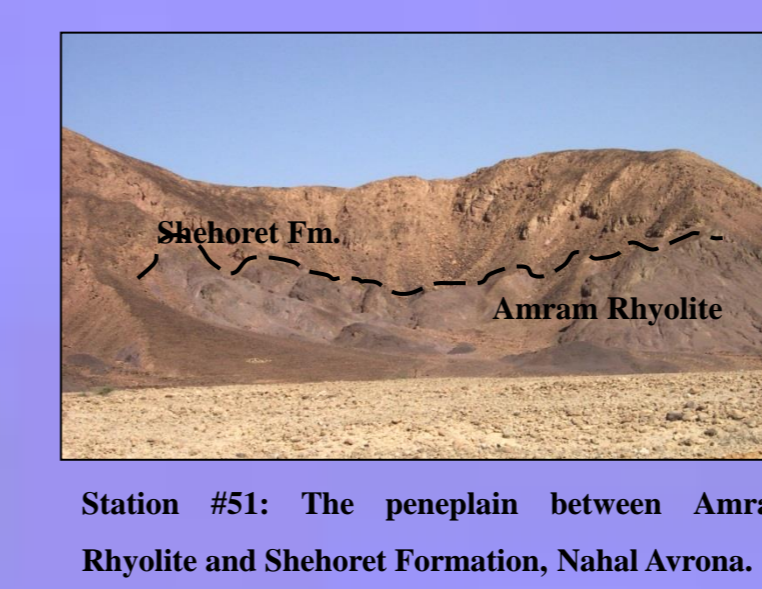
Station #47: Folding of Gerofit limestone beds, "Ezba Elohim", Nahal Eteq.



Station #61: Northern margins of Raham Graben, Nahal Raham.



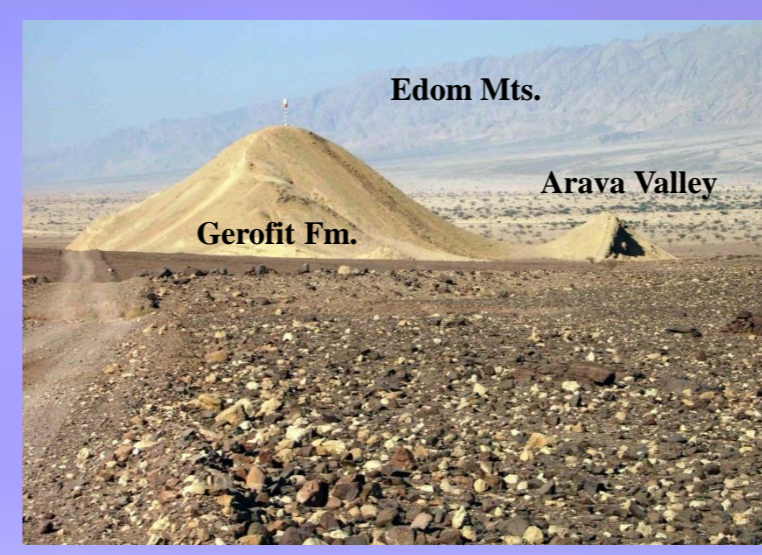
Station #52: Horst of Amir and Avrona formations east of the Nizoz Fault.



Station #51: The penneplain between Amram Rhyolite and Shehoret Formation, Nahal Avrona.



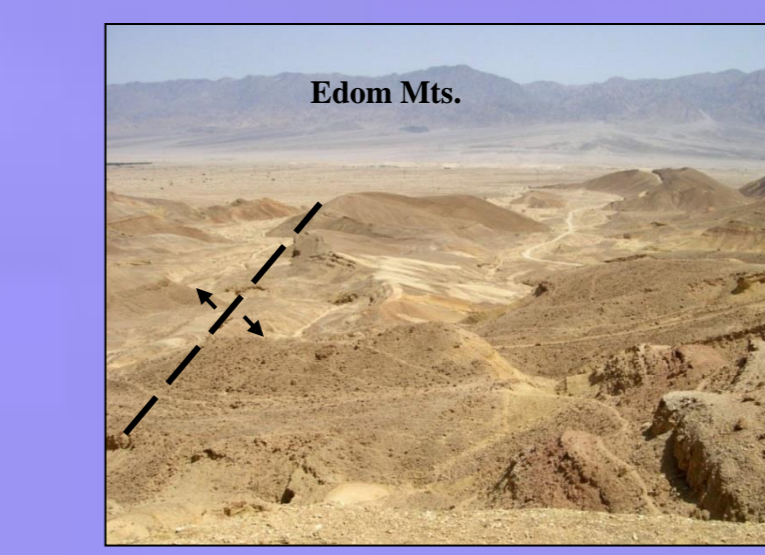
Station #60: Southern fault of Raham Graben striking 230°, Nahal Raham.



Station #62: Raham Conglomerate, Nahal Raham.



Station #58: Ora anticline, direction of axis east-west.



Station #58: Ora anticline, direction of axis east-west.